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| 09/544,344      | 04/06/2000  | Arthur W. Snow       | 0064612-0010        | 8024             |

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EXAMINER

SODERQUIST, ARLEN

ART UNIT PAPER NUMBER

1743

DATE MAILED: 09/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

09/544,344

Applicant(s)

SNOW ET AL.

Examiner

Arlen Soderquist

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4,6-9,21,22,25-38,40-45 and 47-55 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-9,21,22,25-38,40-45 and 47-55 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 April 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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1. Since it is relevant to the interpretation of the claims, examiner defines "coupling agent" as found in the instant specification on page 17, line 22 to page 18, line 20 which is reproduced below with added emphasis.

**"The sensor surface and substrate are cleaned by a plasma or chemical treatment and coupling agents are applied. Coupling agents are difunctional molecules with an inert spacing structure separating the functional groups (e.g. an  $\alpha$ - $\omega$  silyl alkanethiol, such as  $(\text{CH}_3\text{O})_3\text{Si}(\text{CH}_2)_3\text{SH}$ , or a dithiol,  $\text{HS}(\text{CH}_2)_6\text{SH}$ ). One functional group bonds to the sensor/substrate (e.g., the  $-\text{Si}(\text{OCH}_3)_3$  or the  $-\text{SH}$  functional group) surface, and the other (e.g., a second  $-\text{SH}$  functional group) is oriented away from the surface for subsequent bonding with the multiplicity of particles. The ligand shell of the metal particle is a dynamic system where an individual molecule may be displaced by a similarly functionalized molecule. Thus, the immobilized thiol group of the absorbed coupling agent may bond to a particle and immobilize it on the aforementioned surface. In this fashion a monolayer of particles is chemisorbed on the surface. Subsequently, the immobilized particle monolayer is exposed to a solution of a dithiol coupling agent. The dithiol exchanges with some of the monofunctional thiol ligand molecules in the immobilized particle ligand shell and positions the second thiol group on the outer surface of the immobilized particle's ligand shell. A second exposure to a solution for forming the stabilized multiplicity of particles results in chemisorption of a second particle layer on the first. In this manner many layers of particles are built up into a multilayer film."**

From this language in the instant specification, it is clear that when language in the claims excludes coupling agents from the ligand molecules in the encapsulating layer, the three-dimensional structure excludes molecules in the ligand shell that would couple or immobilize the particles to or on a surface or other particles. Additionally, under this definition, exclusion of coupling agents from the encapsulating ligand shell molecules of the encapsulating layer excludes heterofunctionality in the ligand shell molecules capable of binding and/or immobilizing the particles to another particle or surface/substrate within the scope of the particle core and substrate materials of the claim(s). When claims are to the completed 3-dimensional structure of the multiplicity of particles, the encapsulating layer includes all of the molecules in the layer. Thus a coupling agent or a bifunctional molecule that couples two particles or a particle and a substrate together is excluded by the "composed of an encapsulating monomolecular layer of ligand shell molecules that are not coupling agents" language in the claims.

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2. Claim 30 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 27 limits the film of a multiplicity of particles to a "three-dimensional close-packed orientation" or requires that presence of more than a monolayer of particles. Thus this claim is outside of the scope of claim 27.

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-2, 4, 6-9, 21-22, 25-27, 29-38, 40-45 and 47-55 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a device having the multiplicity of core/ligand shell particles in three-dimensional close-packed orientation made by the process of claim 28 when the ligand shell is composed of an encapsulating monomolecular layer of ligand shell molecules that are not coupling agents, does not reasonably provide enablement for a three dimensional structure made by a process other than the spraying process of claim 28. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The above noted definition of a coupling agent appears to exclude the layer by layer method and the final three dimensional structures produced thereby. Page 17, lines 9-11 teach that a method of casting from solution followed by slow evaporation does not produce an acceptable film. See page 17, line 8 through page 19, line 2 of the instant specification for the only methods for forming final structure of the multiplicity of particles in three-dimensional close-packed orientation that are taught in the specification. Applicant and the art of record do not teach any other manner of making the particles in three-dimensional close-packed orientation. Thus, of the three methods taught in the instant specification, only the spraying method appears to be within the scope of the ligand shell being composed of an encapsulating monomolecular layer of ligand shell molecules that exclude coupling agents as in the instant claims. This is because the structure that is being claimed is the final 3-dimensional structure of the multiplicity of particles.

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5. Claims 1-2, 4, 6-9, 21-22, 25-38, 40-45 and 47-55 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Each of the independent claims contains the following phrase "the tail having a structure and composition designed to provide additional stabilization of metal clusters against irreversible agglomeration" in the language describing the properties of the ligand shell. Page 8, lines 11-13 teach that a particle is typically "stabilized" by the metal core being effectively encapsulated by the ligand shell. Page 14, line 18 to page 15, line 1 teach that it is important for the ligand to have a strong interaction with the neutral metal core to prevent the metal core from coagulating and being able to be redispersed. In this section thiol compounds and amines are specifically exemplified as providing this strong interaction. Also in the above definition of a coupling agent, it appears that any bifunctional molecule in which both functional groups cause the particles to be bound to a surface or particle are excluded since they would cause irreversible agglomeration. In this respect examiner points out the previously cited Colvin reference (Journal of the American Chemical Society 1992) which clearly shows that a bifunctional molecule having thiol and carboxylate groups as the two functional groups that can be used to bind particles to an aluminum surface/substrate. Thus it is not clear if the above language regarding the tail structure prevents a bifunctional molecule such as the claimed heterofunctional group from having the carboxyl functionality. There is a particular question as to the allowed scope of the tail (functional group/structure) in claims 37, 40 and 50 in that they specifically recite the carboxyl acid group, that the Colvin reference teaches as having a strong interaction with an aluminum surface (promotes agglomeration) without limiting the metal to something that does not have a strong interaction with a carboxylic acid group.

6. No art rejection is set forth in this office action due to the definition of a coupling agent as set forth above and its exclusion from the ligand shell molecules that make up the ligand shell in the language of all of the independent claims.

7. Applicant's arguments filed July 18, 2006 have been fully considered but they are not persuasive. Relative to the claim interpretation, examiner notes that the claims are directed to a structure having a multiplicity of particles in a 3-dimensional close-packed orientation in which the particles have a core of conductive metal with a ligand shell deposited thereon. The ligand

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shell is composed of an encapsulating monomolecular layer of ligand shell molecules that are not coupling agents. Since it is the final 3-dimensional structure that is being claimed, it is the ligand shell of the particles in this structure that is limited to the absence of ligand shell molecules that are not coupling agents. Examiner asks how can a ligand shell have molecules that are coupling agents intermingled therein without the coupling molecules being part of the ligand shell? It is as if applicant is arguing that in a room having the instant inventors and applicant's representatives therein, only inventors of the instant application are present (or there are no patent agents/attorneys in the room). Another way of saying this is that it is incorrect to say that a room with four people in it has only three people in it. Likewise it is not correct to characterize a ligand shell with coupling molecules intermingled therein as not having coupling molecules as a part of the ligand shell. This is the reason for the lack of enablement of the claims for a scope beyond that of the 3-dimensional structure formed by the method of claim 28. Examiner notes that with process claims it is possible to distinguish the structure of particles prior to formation of the 3-dimensional structure from that of the particles in the three dimensional structure. However it is also clear from the instant specification that of the three methods taught for forming the three-dimensional structure, only two of them produce a usable structure. Thus, the claims are not enabled for the full scope possible by the instant disclosure. Using a product by process format for the device/article of manufacture claims would allow applicant to distinguish the structural differences attributable to the formation process relative to the use of the product for investigating a target environment to determine the presence or amount of a chemical species. Such a distinction may be difficult, if not impossible, with the instant claim format since it covers a structure made by the process that the instant specification clearly teaches as not suitable for the intended purpose. Relative to the clarity of the claims, it appears that applicant is arguing that a carboxylic acid group is excluded by the stabilization against irreversible agglomeration when aluminum is within the scope of the conductive metal and substrate as found in the claims. Since most if not all of the claims are of a scope that would include a material that would bind a carboxylic acid group, the clarity of the claims is lacking.

8. Claims 28, 35-36 and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, set forth in this Office action and to include all of the limitations of the base claim and any intervening

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claims. The art of record fails to teach or suggest the claimed combination or elements. Relative to claims 35-36, it is noted that although the respective elements are conventional as evidenced by the page 21, line 17 to page 22, line 8, examiner was not able to determine if they are part of the measurement apparatus taught by Terrill.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

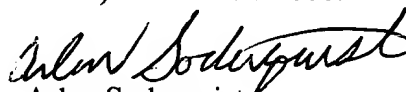
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art relates to formation of metal clusters or particles.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (571) 272-1265. The examiner can normally be reached on Monday-Thursday and Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Arlen Soderquist  
Primary Examiner  
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